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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 060106

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

STEMMER, MACHINE (tobacco) 521.885

5-67

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
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U. S. Employment Service in
Cooperation with
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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR
STEMMER, MACHINE (tobacco) 521.885-398

S-67

Summary

The General Aptitude Test Battery, B-1001 was administered in October 1[illegible] to a sample of 29 workers employed as Stemmers, Machine 521.885 in the Philipsburg, Pennsylvania plant of the National Cigar Company. The GATB, B-1002A was administered in October 1954 to a sample of 42 workers employed in the same occupation in the Nanticoke, Pennsylvania plant of the National Cigar Company. These two subsamples were combined into a total sample of 71 workers for purposes of the statistical analysis.

The criterion used in the correlational analysis for the total sample consists of quantitative values corresponding to high, middle and low criterion categories. Division of workers into these three categories was based on qualitative ratings for the Philipsburg subsample and average earnings for the Nanticoke subsample.

On the basis of the statistical results and the job analysis information, the following aptitudes were selected for inclusion in the norms: K-Motor Coordination, F-Finger Dexterity, and M-Manual Dexterity.

GATB Norms for Stemmer, Machine (tobacco) 521.885 S-67

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Stemmer, Machine (tobacco) 521.885

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for S-67

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
T	CB-1-K CB-1-G	75	K	Part 8	80
F	CB-1-O CB-1-P	75	F	Part 11 Part 12	70
M	CB-1-M CB-1-N	70	M	Part 9 Part 10	70

Effectiveness of Norms

The data in Table IV indicate that 10 of the 15 poor workers, or 67 percent of them, did not achieve the minimum scores on the recommended test norms. This shows that 67 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 45 of the 50 workers who made qualifying test scores, or 90 percent of [illegible] workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Stemmer, Machine (tobacco) 521.885

II. Samples

This study is based on two groups of workers employed as Stemmer, Machine 521.885 in the Philipsburg, Pennsylvania plant and in the Nanticoke, Pennsylvania plant of the National Cigar Company.

A. Philipsburg Subsample

The GATB, B-1001, was administered in October 1948 to a total of 36 women employed in the Stripping Department. All workers performing the job duties of Stemmer, Machine 521.885 were tested. Two experienced workers and five trainees were eliminated from the sample because criterion data were not available for them. This left a final sample of 29 experienced workers for whom complete data were available. This was the sample on which the statistical analysis was based.

The workers in this sample were originally selected for employment on the basis of an interview after referral by the local Employment Service office. Eight years of education was desirable. There were no other stated requirements.

B. Nanticoke Subsample

The GATB, B-1002A, was administered in October 1954 to 50 women employed as Stemmer, Machine 521.885. This sample represents a random selection from a total of 84 women employed on this job. The eight workers with the most experience were eliminated from the sample. This was considered desirable because of the reduction in correlation between experience and the average earnings criterion from .45 to .06 when these workers are excluded from the sample.

The workers in this sample were originally selected for employment on the basis of an interview by the general manager. There were no age, education or experience requirements for selection.

Four or five weeks of on-the-job training is conducted. It consists of instruction and guidance by the floorlady.

C. Total Sample

The job duties and the criterion data for the workers in the Nanticoke and Philipsburg subsamples were considered sufficiently comparable to justify combination of these samples. Thus, the statistical analysis was based on the total sample of 71 workers.

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Table II shows the means, standard deviations, ranges, Pearson product-moment correlations (corrected for broad categories) with the criterion and standard errors of correlation for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) and Standard Errors of Correlation ($\bar{\sigma}_{c}r$) for Age, Education and Experience

Stemmer, Machine (tobacco) 521.885
N = 71

	M	σ	Range	$_{c}r$	$\sigma_{c}r$
Age (years)	24.2	6.9	17 - 46	.298*	.103
Education (years)	9.6	1.7	6 - 12	.002	.119
Experience (months)	14.3	13.9	1 - 59	.150	.116

*Significant at the .05 level of confidence

The correlation between age and the criterion is significant at the .05 level indicating that there is a tendency for the older workers to be more productive or for supervisors to assign higher ratings to older workers. The correlations between the criterion and education and experience are not significant.

III. Job Description

Job Title: Stemmer, Machine (tobacco) 521.885

Job Summary: Removes stems of tobacco leaves by machine. Picks up lot of tobacco and carries tobacco to machine. Feeds and operates machine which stems and books tobacco leaves. Removes books of half-leaves from machine when machine is filled.

Work Performed

Picks up lot of tobacco from weighing scale, punches time card in time clock to register the time lot is received, and carries lot to machine. Picks up handful of tobacco, unties it, and places leaves on tray in front of machine. Picks up three or four leaves at a time and feeds them, one by one, into the machine. Positions butt end of leaf under feed guide, with back of leaf up and with stem directly under center groove. Presses trip lever with right foot to start machine. Works brake pedal back and forth with left foot to control machine as leaf is being fed. Removes books of half-leaves from machine when machine is filled. Opens front apron of machine by moving a hand lever, pulls out the two stacks of leaves, pressing on brake pedal to unroll them from drum of machine, and places them on tray. Continues operation of machine.

IV. Experimental Battery

All of the tests of the GATB, B-1001, were administered to the Philipsburg subsample. All of the tests of the GATB, B-1002A, were administered to the Nanticoke subsample.

V. Criterion

A. Philipsburg Subsample

The criterion consists of qualitative ratings in three broad categories made by the forelady. The ratings were based on quality and quantity of work performed.

B. Nanticoke Subsample

The criterion consists of three broad categories based on average earnings over a 23-week period. Broad categories were used in order to derive a criterion comparable to that used for the Philipsburg subsample.

C. Total Sample

The number of workers in the high, middle and low criterion groups for the Philipsburg subsample, the Nanticoke subsample and the total sample are as follows:

	Philipsburg	Nanticoke	Total
High	9	16	25
Middle	13	18	31
Low	7	8	15
Total	29	42	71

Quantitative values of 61, 48 and 36, were assigned to the high, middle and low criterion groups, respectively, on the basis of the distribution of workers in these groups for the total sample. These values were used as the criterion scores in the correlational analysis.

VI. Statistical and Qualitative Analysis

As indicated in Section II. C. Total Sample, the data obtained for the Nanticoke and Philipsburg subsamples were considered sufficiently comparable to justify combination of these samples for the statistical analysis.

The Philipsburg subsample was tested with the B-1001 edition of the GATB and the Nanticoke subsample was tested with the B-1002A edition of the GATB. Since scores on these two forms are not directly comparable, the B-1001 scores of the workers in the Philipsburg sample were converted to their B-1002 equivalents before means, standard deviations, and correlations were computed for the total sample.

Table III shows the means, standard deviations, Pearson product-moment correlations (corrected for broad categories) with the criterion and standard errors of correlation for the aptitudes of the GATB, B-1002. The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{cr}$) and Standard Errors of Correlation (σ_{cr}) for the Aptitudes of the GATB, B-1002

Stemmer, Machine (tobacco) 531.885
N = 71

Aptitudes	M	σ	cr	σ_{cr}
G-Intelligence	83.8	15.0	.098	.118
V-Verbal Aptitude	85.0	12.4	-.039	.118
N-Numerical Aptitude	86.7	18.9	.035	.119
S-Spatial Aptitude	85.0	14.8	.144	.116
P-Form Perception	95.5	15.8	-.005	.119
Q-Clerical Perception	96.5	16.1	.034	.119
K-Motor Coordination	97.6	15.8	.085	.118
F-Finger Dexterity	91.0	18.1	.227	.112
M-Manual Dexterity	86.0	17.9	.221	.113

The statistical results were interpreted in the light of the job analysis information for Stemmer, Machine 531.885. Analysis of work performed indicates that the following aptitudes measured by the GATB appear to be important for this job:

Aptitude K - Motor Coordination appears necessary to coordinate eyes and hands when positioning leaves and feeding them into the machine.

Aptitude M - Manual Dexterity and Aptitude F - Finger Dexterity appear necessary to position and manipulate leaves as they are fed into the machine.

The statistical results in Table III show that (1) the aptitudes with the highest means are P, Q, K, and F and (2) the aptitudes with the highest correlations with the criterion are F and M. Neither of these correlations is significant at the .05 level of confidence, but both approach significance at this level.

Aptitudes K, F, and M were selected for inclusion in the norms on the basis of statistical evidence and job analysis information. All three of these aptitudes appear important on the basis of job analysis data; Aptitudes K and F have relatively high means; and Aptitudes F and M have higher correlations with the criterion than do any of the other aptitudes.

Although Aptitudes P and Q both have relatively high means, there is no other statistical evidence of significance and neither aptitude appears important in terms of the job analysis data. Therefore, Aptitudes P and Q were not included in the norms.

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The cutting scores for Aptitudes K and M were each set at one standard deviation below the mean and rounded to the nearest five-point score level. The cutting score for Aptitude F was set at one standard deviation below the mean and rounded to the lower adjacent five-point score level to effect better selective efficiency. The resulting norms consist of K-80, F-70, M-70.

VII. Concurrent Validity of Norms

In order to determine the validity of the norms, a tetrachoric correlation coefficient between the norms and the criterion was computed. Table IV shows the relationship between norms consisting of Aptitudes K, F, and M with critical scores of 80, 70, and 70, respectively, and the criterion for Stemmer, Machine (tobacco) 521.885. Workers in the high and middle criterion groups have been designated as "good workers;" workers in the low criterion group have been designated as "poor workers."

TABLE IV

Relationship between B-1002 Test Norms Consisting of Aptitudes K, F, and M with Critical Scores of 80, 70, and 70, Respectively and Criterion for Stemmer, Machine (tobacco) 521.885

N = 71

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	11	45	56
Poor Workers	10	5	15
Total	21	50	71

$r_{tet} = .69$ $\quad X^2 = 10.375$

$\sigma_{r_{tet}} = .22$ $\quad P/2 < .005$

The data in Table IV indicate that test norms consisting of K-80, F-70, and M-70 yield good selective efficiency for the sample on which the analysis was based. The results of the Chi Square test indicate that the obtained relationship is significant.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis information, and their combined selective efficiency, Aptitudes K, F, and M with minimum scores of 80, 70, and 70, respectively are recommended as B-1002 norms for Stemmer, Machine 521.885. The equivalent B-1001 norms are T-75, F-75, and M-70.